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## The association between physical activity and burnout among medical students in Riyadh, Saudi Arabia

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**Author Affiliation:**

<sup>1</sup>College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU), P.O Box 7544, Riyadh, Kingdom of Saudi Arabia

<sup>2</sup>Department of Family Medicine, College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Kingdom of Saudi Arabia

**Contact Information**

Ibrahim Ahmed: dribrahima@hotmail.com  
 Mohammed Abdulrahman Alfadhel: maf4944@gmail.com  
 Ahmad Mamoun Khalaf: ahmad\_khalaf@live.com

**Corresponding author**

College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU), P.O Box 7544, Riyadh, Kingdom of Saudi Arabia  
 Email: xzom20@gmail.com

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Abdulrahman M Alothman<sup>1</sup>✉, Ibrahim Ahmed<sup>2</sup>,  
 Mohammed A Alfadhel<sup>1</sup>, Ahmad M Khalaf<sup>1</sup>

**ABSTRACT**

**Background:** The prevalence of burnout among physicians is significantly high. Although the cause of burnout is unclear, many have reported that it originally begins during medical school. Burnout has been found to cause lower academic achievements and bad quality of life in addition to poor levels of mental and physical well-being. It was originally reported that physical activity is associated with decreased frequency of burnout events. There are few studies on the connection for both physical training and burnout among medical students. The goal of this research is to see if there's any correlation in both physical training and burnout among medical students in Riyadh, Saudi Arabia. **Methodology:** Maslach's burnout instrument and Baeck's physical activity tool were used in this cross-sectional study on male and female medical students from several medical colleges in Riyadh, Saudi Arabia. The questionnaire measured physical activity and burnout levels, as well as the relationship between the two. **Results:** A total of 411 responses were received, with males accounting for 50.6%. Nearly half of medical students (49%) reported emotional exhaustion at a modest level, while 11.4% reported severe emotional exhaustion. 56% had low physical activity levels whereas 41.6% had moderate physical activity levels, with 2.4% reporting high physical activity levels. Physical activity was shown to be positively correlated with academic efficacy and negatively correlated with emotional exhaustion and cynicism. **Conclusion:** Medical students in Riyadh had lower levels of burnout and physical activity in comparison to other studies. Physical activity was concluded to have a substantial negative correlation with emotional exhaustion and cynicism, and a positive correlation with academic efficacy.

**Keywords:** burnout, physical activity, medical student, Saudi Arabia

**1. INTRODUCTION**

The term "burnout" refers to a condition of emotional exhaustion, depersonalization and cynicism accompanied by a decreased sense of personal accomplishment especially among those who work closely with



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people (Olson et al., 2014; Maslach et al., 1996). The rate of burnout among medical workers is extremely high; it is estimated that 55–76% of internal medicine residents have experienced burnout (Olson et al., 2014). Although the reason behind this phenomenon is unclear, medical professionals have reported that these burnout events originally started during medical school. Burnout affects 49% of U.S.A medical students and 28–61% of Australian medical students, according to Macilwrait et al., (2018). The effects of burnout on an individual include lower academic achievements and decreased quality of life in addition to poor levels of mental and physical wellbeing (Macilwrait et al., 2018; Ikram et al., 2021; Alsaad et al., 2021). Consequently, this results in the inability to handle responsibilities and duties appropriately (Azhari et al., 2020).

Physical activity and exercise have been associated with significant reductions in the occurrence of burnout; however, quite a few researches have investigated the relation in both physical training and burnout, specifically among medical students (Macilwrait et al., 2018). An observational cross-sectional study conducted on medical students at University College Cork in Ireland revealed that severe emotional exhaustion was present in 44.8% of medical students. Increased levels of physical activity were linked to higher professional efficacy. Additionally, males (66%) were significantly more physically active (66%) than females (45%) (Macilwrait et al., 2018).

Another study conducted in the United Kingdom investigated the correlation between burnout and a number of variables including alcohol use, physical activity, diet and smoking. Out of all the lifestyle and behavioral factors, physical activity was the most predictive. Physical activity and emotional exhaustion were found to be negatively correlated. This demonstrated the need of promoting medical students' awareness of physical activity and its impact on burnout levels (Cecil et al., 2014). According to Dyrbye et al., (2014), burnout was less prevalent among medical students who exercised and did strength training routinely in accordance with the Centers for Disease Control and Prevention (CDC) recommendations, compared to those who exercised less ( $p < 0.0001$ ). Generally, Medical students who followed the CDC exercise recommendations had greater quality of life scores ( $p < 0.0001$ ).

A report that assessed the viability of a 12-week team-based incentivized training program found that in comparison with the control group, residents and fellows who participated in the intervention were more likely to follow the Department of Health and Human Services' exercise recommendations, had better wellbeing, and reduced risk of burnout (Weight et al., 2013). In 2013, in a pilot study to investigate the exercise's impact on burnout levels, twelve male participants with high levels of burnout participated in a 12-week exercise training program. Increased training significantly lowered overall perceived stress, burnout, and depression levels, according to the findings. Furthermore, the mood of the participants significantly improved following a single exercise session (Gerber et al., 2013). The goal of this study is to assess the relationship in both physical training and burnout among Saudi Arabian medical students in Riyadh.

## 2. METHODOLOGY

A self-administered online questionnaire was used to perform a cross-sectional study using the Maslach's burnout instrument and Baek's physical activity tool. Both male and female medical students from various medical colleges in Riyadh, Saudi Arabia, were called to participate in the research. The medical colleges that participated in this study were Imam Mohammad Ibn Saud Islamic University (IMSIU), King Saud University (KSU), King Saud bin Abdulaziz University for Health Sciences (KSAU-HS) and Princess NourahBint Abdul Rahman University (PNU). At least 350 students from the pre-clinical and clinical years took part in the study. There were two sections to the questionnaire. The first section assessed the participants' demographic data such as age, gender and medical academic level. The second section investigated the participants' physical activity habits, burnout levels and any potential association between them.

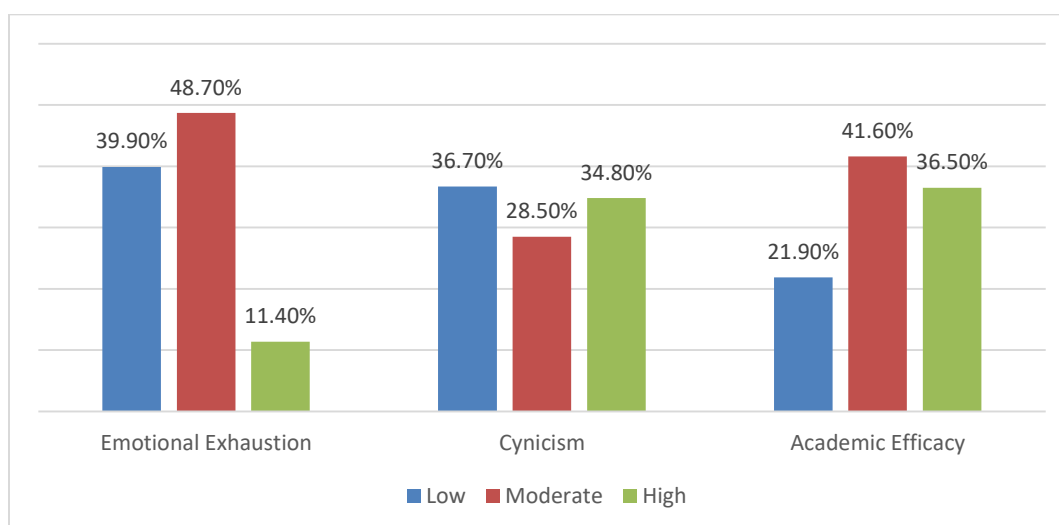
The duration of study started from December 2020 to May 2021. The data were analyzed using the Statistical Package for Social Sciences Program, version 24 (IBM Corp., Armonk, NY, USA). Burnout was divided into three categories: emotional exhaustion, cynicism and academic efficiency. Categorical data was described using frequency and proportions. The relationship among categorical variables was assessed using the Chi-squared and Pearson correlation coefficient ( $r$ ) tests. A  $p$ -value  $\leq 0.05$  was considered statistically significant.

## 3. RESULTS

A total of 411 medical students participated in this study, of which 208 were males (50.6%) and 203 were females (49.4%). A quarter of the samples (25.3%) were in their second academic year, 22.6% of the participants were in their first year and 13.9% were in their fourth year of medical education. More than half of the people who took part in the survey had a grade point average (GPA) of 4.5–5 (54.5%) while only 1.5% had a GPA less than 2.75. The majority of the participants were from the northern region (44.8%). A

hundred forty-five participants were from IMSIU (35.3%), 119 were from KSU (29%), 78 were from KSAU-HS (19%) and 69 were from PNU (16.8%) (Table 1).

Table 1 Demographic characteristics of participants			
Variable		Count	Percentage
Gender	Male	208	50.6%
	Female	203	49.4%
Marital status	Single	404	98.3%
	Married	7	1.7%
	Divorced	0	0.0%
Academic Year	First year	93	22.6%
	Second year	104	25.3%
	Third year	84	20.4%
	Fourth year	57	13.9%
	Fifth year	73	17.8%
GPA	4.5-5	224	54.5%
	3.75-4.5	152	37.0%
	2.75-3.75	29	7.1%
	less than 2.75	6	1.5%
Region of residence in Riyadh	Northern region	184	44.8%
	Eastern region	126	30.7%
	Southern region	43	10.5%
	Western region	58	14.1%
College of medicine	IMSIU	145	35.3%
	KSU	119	29.0%
	KSAU-HS	78	19.0%
	PNU	69	16.8%



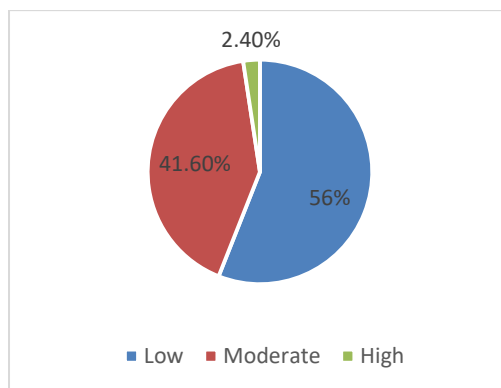
**Figure 1** Distribution of students according to their burnout level

According to Figure 1, 48.7% of the study sample had emotional exhaustion at a modest level, while 11.4% had high levels of emotional exhaustion. Approximately 35% had high levels of cynicism while 28.5% had moderate levels of cynicism. Moreover, 41.6% of students had moderate academic efficacy levels while 21.9% reported low academic efficacy levels.

**Table 2** The relation between demographic factors of participants and level of burnout

Variable		Emotional Exhaustion			Cynicism			Academic Efficacy		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Gender	Male	44.7%	46.2%	9.1%	41.8%	29.3%	28.8%	21.6%	39.4%	38.9%
	Female	35.0%	51.2%	13.8%	31.5%	27.6%	40.9%	22.2%	43.8%	34.0%
	P-Value	0.085			0.025*			0.533		
Marital status	Single	39.4%	49.0%	11.6%	36.4%	29.0%	34.7%	22.3%	41.1%	36.6%
	Married	71.4%	28.6%	0.0%	57.1%	0.0%	42.9%	0.0%	71.4%	28.6%
	P-Value	0.204			0.227			0.201		
Academic Year	First year	46.2%	45.2%	8.6%	43.0%	20.4%	36.6%	21.5%	34.4%	44.1%
	Second year	29.8%	53.8%	16.3%	26.0%	34.6%	39.4%	27.9%	44.2%	27.9%
	Third year	44.0%	46.4%	9.5%	42.9%	20.2%	36.9%	21.4%	50.0%	28.6%
	Fourth year	40.4%	49.1%	10.5%	40.4%	33.3%	26.3%	14.0%	42.1%	43.9%
	Fifth year	41.1%	47.9%	11.0%	34.2%	35.6%	30.1%	20.5%	37.0%	42.5%
	P-Value	0.428			0.055			0.108		
GPA	(4.5-5)	40.6%	46.0%	13.4%	44.2%	23.2%	32.6%	20.1%	38.4%	41.5%
	(3.75 - 4.5)	38.8%	53.3%	7.9%	30.9%	37.5%	31.6%	18.4%	50.7%	30.9%
	(2.75 -less than 3.75)	44.8%	44.8%	10.3%	17.2%	27.6%	55.2%	48.3%	17.2%	34.5%
	(less than 2.75)	16.7%	50.0%	33.3%	0.0%	0.0%	100.0%	50.0%	50.0%	0.0%
	P-Value	0.301			0.000*			0.000*		
Region of residence in Riyadh	Northern region	38.0%	50.5%	11.4%	34.8%	29.3%	35.9%	19.6%	41.3%	39.1%
	Eastern region	37.3%	46.8%	15.9%	39.7%	19.8%	40.5%	25.4%	46.0%	28.6%
	Southern region	46.5%	48.8%	4.7%	25.6%	46.5%	27.9%	25.6%	25.6%	48.8%
	Western region	46.6%	46.6%	6.9%	44.8%	31.0%	24.1%	19.0%	44.8%	36.2%
	P-Value	0.349			0.02*			0.154		
College of medicine	IMSIU	38.6%	49.0%	12.4%	44.1%	23.4%	32.4%	21.4%	42.8%	35.9%
	KSU	42.0%	47.9%	10.1%	26.9%	36.1%	37.0%	26.1%	38.7%	35.3%
	KSAU-HS	38.5%	47.4%	14.1%	38.5%	29.5%	32.1%	20.5%	43.6%	35.9%
	PNU	40.6%	50.7%	8.7%	36.2%	24.6%	39.1%	17.4%	42.0%	40.6%
	P-Value	0.954			0.108			0.877		
* significant at p value ≤0.05										

The association between burnout levels in medical students and a variety of demographic characteristics is shown in Table 2. Despite the fact that emotional tiredness and academic efficacy exhibited no significant relation with gender, females showed a significantly higher level of cynicism in comparison to males (40.9% vs 28.8%,  $p=0.025$ ). The marital status and academic level of the respondents had an insignificant effect on burnout. Students with higher GPAs showed a significantly lower level of cynicism and academic efficacy at a higher level ( $p=0.00$ ). Moreover, medical students living in the eastern region had the highest level of cynicism ( $p=0.02$ ). None of the burnout categories were significantly affected by the participants' medical college.



**Figure 2** Distribution of participants depending on their level of physical activity

The levels of physical activity among medical students are demonstrated in Figure 2. Only 2.4% of medical students had high levels of physical exercise, while physical training was low in 56% of the participants, and 41.6% had moderate levels of physical activity. Although the average number of hours spent on exercise such as vigorous activity, walking and moderate exercise was 331.67 hours per week; the average number of minutes spent in active was 175 minutes per day.

<b>Table 3</b> The relation between demographic factors of participants and physical activity					
Variable		Physical Activity Inventory			
		Low	Moderate	High	
Gender	Male	56.7%	41.3%	1.9%	0.778
	Female	55.2%	41.9%	3.0%	
Marital status	Single	56.2%	41.3%	2.5%	0.669
	Married	42.9%	57.1%	0.0%	
	Divorced	0.0%	0.0%	0.0%	
Academic Year	First year	60.2%	38.7%	1.1%	0.038*
	Second year	65.4%	32.7%	1.9%	
	Third year	54.8%	42.9%	2.4%	
	Fourth year	56.1%	38.6%	5.3%	
	Fifth year	38.4%	58.9%	2.7%	
GPA	(4.5-5)	56.3%	42.0%	1.8%	0.565
	(3.75 - 4.5)	54.6%	42.8%	2.6%	
	(2.75 -less than 3.75)	55.2%	37.9%	6.9%	
	(Less than 2.75)	83.3%	16.7%	0.0%	
Region of residence in Riyadh	Northern region	49.5%	46.7%	3.8%	0.025*
	Eastern region	58.7%	38.9%	2.4%	
	Southern region	51.2%	48.8%	0.0%	
	Western region	74.1%	25.9%	0.0%	
College of medicine	IMSIU	56.6%	42.1%	1.4%	0.609
	KSU	58.0%	40.3%	1.7%	
	KSAU-HS	55.1%	42.3%	2.6%	
	PNU	52.2%	42.0%	5.8%	

Our findings demonstrated that both academic level and place of residence had a significant effect on medical students' physical activity levels. First-year medical students demonstrated a higher level of physical activity, indicating that physical activity is decreased with increased academic progression. Moreover, when compared to students in the northern and southern regions, students in the western region demonstrated the least physical activity level. ( $p=0.025$ ). The identity of the medical college had no significant effect on the physical activity among medical students (Table 3). There was no significant relation between the physical

training levels and emotional exhaustion and cynicism according to Table 4 ( $p=0.147$  and  $p=0.146$ , respectively). Nevertheless, a significant relation between physical training and academic efficacy was recorded ( $p=0.021$ ).

Table 4 The relationshipamong physical activity and burnout level								
Variable		Physical Activity Inventory						
		Low		Moderate		High		
		Count	Column N %	Count	Column N %	Count	Column N %	
Emotional Exhaustion	Low	80	34.8%	78	45.6%	6	60.0%	0.147
	Moderate	123	53.5%	74	43.3%	3	30.0%	
	High	27	11.7%	19	11.1%	1	10.0%	
Cynicism	Low	81	35.2%	68	39.8%	2	20.0%	0.146
	Moderate	59	25.7%	53	31.0%	5	50.0%	
	High	90	39.1%	50	29.2%	3	30.0%	
Academic Efficacy	Low	56	24.3%	31	18.1%	3	30.0%	0.021*
	Moderate	104	45.2%	66	38.6%	1	10.0%	
	High	70	30.4%	74	43.3%	6	60.0%	

Table 5 Correlations between burnout categories and physical activity of students.					
		Emotional Exhaustion	Cynicism	Academic Efficacy	Physical Activity Inventory
Emotional Exhaustion	Pearson Correlation	1	.585**	-.182**	-.099*
	Sig. (2-tailed)		.000	.000	.044
	N	411	411	411	411
Cynicism	Pearson Correlation	.585**	1	-.356**	-.065-
	Sig. (2-tailed)	.000		.000	.190
	N	411	411	411	411
Academic Efficacy	Pearson Correlation	-.182**	-.356**	1	.126*
	Sig. (2-tailed)	.000	.000		.011
	N	411	411	411	411
Physical Activity Inventory	Pearson Correlation	-.099*	-.065-	.126*	1
	Sig. (2-tailed)	.044	.190	.011	
	N	411	411	411	411
**. Correlation is significant at the 0.01 level (2-tailed).					
*. Correlation is significant at the 0.05 level (2-tailed).					

The correlation between burnout and physical activity levels is illustrated in Table 5. A strong positive correlation was found between emotional exhaustion and cynicism ( $r=0.585$ ). There was a weak negative correlation between both emotional exhaustion and cynicism and academic efficacy ( $r=-0.182$  and  $r=-0.356$ , respectively). Moreover, emotional exhaustion and cynicism showed a weak negative correlation with physical activity ( $r=-0.099$  and  $r=-0.065$ , respectively) while academic efficacy showed a weak positive correlation with physical activity ( $r=0.126$ ).



#### 4. DISCUSSION

Medical schools are designed to graduate highly qualified physicians by developing their knowledge, skill and competence (Almalki et al., 2017). This in turn may result in multiple academic and psychological stressors which could induce some major mental health conditions among medical students (Dyrbye et al., 2006). Few studies assessed the burnout level and its relationship to physical activity among medical students in Riyadh, Saudi Arabia. The goal of this research was to identify the existing level of burnout and physical activity among medical students in Riyadh, as well as any correlations between the two. The present study showed that 11.4% and 34.8% of medical students had high emotional exhaustion and cynicism levels, respectively, and 21.9% reported low levels of academic efficacy. These results are lower than a study conducted by Almalki et al., (2017) which showed that 58.6% and 62.3% of medical students had high levels of emotional exhaustion and cynicism, respectively, and 60.2% had low professional efficacy. According to a research project at Taif University, 27% of medical students had elevated emotional exhaustion levels, 62.4% had high levels of cynicism and 8.9% had low professional efficacy (Alotaibi et al., 2021). Similarly, two other studies conducted in Hong Kong and Brazil also reported high scores of emotional exhaustion and cynicism and low levels of physical activity and academic efficacy among their students (Lee et al., 2020; Costa et al., 2012).

Gender had no significant relation to emotional exhaustion and academic efficacy in this study; however, females showed a significantly higher level of cynicism compared to males. This partially contradicts the findings of Altannir et al., (2019) that state a significantly higher level of emotional exhaustion and cynicism and a significantly lower level of personal accomplishment in females as compared to males. Nevertheless, our results were consistent with those of Almalki et al., (2017) which found no significant correlation between gender and burnout levels. This indicates that females may experience burnout more frequently than males. Females are more susceptible to burnout possibly due to a variety of cultural, social, and religious factors that may affect emotional exhaustion and academic efficacy. Saudi culture prohibits gender intermingling which may have a negative impact on their clinical exposure during medical training (Abdulghani et al., 2014). Additionally, extended time with family is a major part of Saudi culture, which may cause further stress in trying to balance studying and family responsibilities (Azhari et al., 2020). In concordance with other previous studies, the medical academic level had an insignificant impact on burnout levels (Azhari et al., 2020; Mahfouz et al., 2020; Alzubaidi et al., 2020).

Greater than half of the sample in this study had reduced physical training levels while only 2.4% had high levels of physical activity. These findings notably differ from other studies conducted in Ireland, China, Canada, and the United States which showed higher levels of physical activity among medical students (Macilwrait et al., 2018; Hao et al., 2014; Holtz et al., 2013; Stanford et al., 2012). This may be related to the 2019 global coronavirus pandemic (COVID-19) and lockdown restrictions which according to many studies had a adverse influence on physical activity (Dunton et al., 2020; Tulchin-Francis et al., 2021; Theis et al., 2021). The academic level of medical students had a significant effect on the physical training level in this study such that physical activity levels decreased with the progression of academic years which is similar with the findings of other investigations (Macilwrait et al., 2018; Ball et al., 2002; Frank et al., 2006). This can be explained by the increased amount of academic activities and responsibilities with the progression of medical school which may in turn decrease the amount of spare time that can be utilized for physical activity. Moreover, students living in the western region showed the lowest physical activity levels while students living in the northern and southern region reported the highest levels of physical activity.

Physical activity was found to have a weak negative correlation with emotional exhaustion and cynicism, and a weak positive correlation with academic efficacy in this study. This validates previous reports that show a negative relationship in both physical training and emotional exhaustion, and less frequent burnout occurrences with increasing level of physical activity (Cecil et al., 2014; Sane et al., 2012; Li et al., 2009; Platsidou et al., 2010; Alhaqbani et al., 2020). This indicates the positive influence of physical training on medical students' emotional state and academic efficiency. Therefore, it is pertinent to educate medical students on the physical activity's relevance by providing training courses and sports events. It is plausible that some limitations were identified in this study that might have influenced our results and explain the reason for lower burnout levels compared to other studies. The use of self-reported questionnaire is subject to social desirability bias and recall bias.

#### 5. CONCLUSION

In comparison to previous researches, this study showed reduced levels of burnout and physical activity among medical students. A negative relationship among physical training and emotional exhaustion and cynicism was detected, in addition to a positive relationship in both physical training and academic efficacy. Females were more prone to be affected by burnout. Moreover, physical activity was lower in students of higher academic levels. Additional studies with a higher sample size and an inclusion of a wider region of Saudi Arabia is required to generalize our findings.

**Author's Contributions**

AMA and IA contributed to the design and idea of the study. MAA and AMK contributed to the data collection and interpretation of the result. IA and MAA contributed to drafting of the manuscript. AMA, MAA and AMK contributed to reviewing and editing the manuscript. All authors approved the final version of the manuscript .

**Ethical approval**

The study was approved by the Medical Ethics Committee of Imam Mohammad Ibn Saud Islamic University (ethical approval code: HAPO-01-R-011, Project No. 123-2020, Session No. 39).

**Consent for publication**

Informed consent was obtained from all the participants.

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**Conflicts of interest**

The authors declare that they have no conflict of interest.

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**Data and materials availability**

All data associated with this study are present in the paper.

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